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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	002717.P013
First Inventor	Manish Rath
Title	METHOD AND APPARATUS FOR MANAGEMENT OF CONFIGURATION IN A NETWORK
Express Mail Label No.	EL034433735US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents
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- ☒ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
- ☐ Applicant claims small entity status.
See 37 CFR 1.27.
- ☒ Specification [Total Pages 23]
(preferred arrangement set forth below)
 - Descriptive title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to sequence listing, a table, or a computer program listing appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
- ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 3]
- ☐ Oath or Declaration [Total Pages 3]
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 - ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 17 completed)
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Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b)
- ☐ Application Data Sheet. See 37 CFR 1.76

- ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
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ACCOMPANYING APPLICATION PARTS

- ☐ Assignment Papers (cover sheet & document(s))
- ☐ 37 C.F.R. § 3.73(b) Statement (when there is an assignee) ☐ Power of Attorney
- ☐ English Translation Document (if applicable)
- ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
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Prior application Information: Examiner _____ Group/Art Unit: _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

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TOTAL AMOUNT OF PAYMENT (\$) 1,148.00		Application Number	
		Filing Date October 26, 2000	
		First Named Inventor Manish Rath	
		Examiner Name	
		Group/Art Unit	
		Attorney Docket No. 002717.P013	

<h4 style="text-align: center; margin: 0;">METHOD OF PAYMENT (check one)</h4> <p>1. <input type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:</p> <p>Deposit Account Number 02-2666</p> <p>Deposit Account Name Blakely, Sokoloff, Taylor & Zafman LLP</p> <p><input checked="" type="checkbox"/> Charge Any Additional Fee(s) Required Under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20</p> <p><input checked="" type="checkbox"/> Applicant claims small entity status See 37 CFR 1.27</p> <p>2. <input checked="" type="checkbox"/> Payment Enclosed:</p> <p><input checked="" type="checkbox"/> Check <input type="checkbox"/> Credit card <input type="checkbox"/> Money Order <input type="checkbox"/> Other</p>	<h4 style="text-align: center; margin: 0;">FEE CALCULATION (continued)</h4> <h5 style="text-align: center; margin: 0;">3. ADDITIONAL FEE</h5> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Large Entity</th> <th colspan="2">Small Entity</th> <th rowspan="2">Fee Description</th> <th rowspan="2">Fee Paid</th> </tr> <tr> <th>Fee Code</th> <th>Fee (\$)</th> <th>Fee Code</th> <th>Fee (\$)</th> </tr> </thead> <tbody> <tr> <td>105</td> <td>130</td> <td>205</td> <td>65</td> <td>Surcharge - late filing fee or oath</td> <td></td> </tr> <tr> <td>127</td> <td>50</td> <td>227</td> <td>25</td> <td>Surcharge - late provisional filing fee or cover sheet.</td> <td></td> </tr> <tr> <td>139</td> <td>130</td> <td>139</td> <td>130</td> <td>Non-English specification</td> <td></td> </tr> <tr> <td>147</td> <td>2,520</td> <td>147</td> <td>2,520</td> <td>For filing a request for reexamination</td> <td></td> </tr> <tr> <td>112</td> <td>920*</td> <td>112</td> <td>920*</td> <td>Requesting publication of SIR prior to Examiner action</td> <td></td> </tr> <tr> <td>113</td> <td>1,840*</td> <td>113</td> <td>1,840*</td> <td>Requesting publication of SIR after Examiner action</td> <td></td> </tr> <tr> <td>115</td> <td>110</td> <td>215</td> <td>55</td> <td>Extension for response within first month</td> <td></td> </tr> <tr> <td>116</td> <td>390</td> <td>216</td> <td>195</td> <td>Extension for response within second month</td> <td></td> </tr> <tr> <td>117</td> <td>890</td> <td>217</td> <td>445</td> <td>Extension for response within third month</td> <td></td> </tr> <tr> <td>118</td> <td>1,390</td> <td>218</td> <td>695</td> <td>Extension for response within fourth month</td> <td></td> </tr> <tr> <td>128</td> <td>1,890</td> <td>228</td> <td>945</td> <td>Extension for response within fifth month</td> <td></td> </tr> <tr> <td>119</td> <td>310</td> <td>219</td> <td>155</td> <td>Notice of Appeal</td> <td></td> </tr> <tr> <td>120</td> <td>310</td> <td>220</td> <td>155</td> <td>Filing a brief in support of an appeal</td> <td></td> </tr> <tr> <td>121</td> <td>270</td> <td>221</td> <td>135</td> <td>Request for oral hearing</td> <td></td> </tr> <tr> <td>138</td> <td>1,510</td> <td>138</td> <td>1510</td> <td>Petition to institute a public use proceeding</td> <td></td> </tr> <tr> <td>140</td> <td>110</td> <td>240</td> <td>55</td> <td>Petition to revive - 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late filing fee or oath		127	50	227	25	Surcharge - late provisional filing fee or cover sheet.		139	130	139	130	Non-English specification		147	2,520	147	2,520	For filing a request for reexamination		112	920*	112	920*	Requesting publication of SIR prior to Examiner action		113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action		115	110	215	55	Extension for response within first month		116	390	216	195	Extension for response within second month		117	890	217	445	Extension for response within third month		118	1,390	218	695	Extension for response within fourth month		128	1,890	228	945	Extension for response within fifth month		119	310	219	155	Notice of Appeal		120	310	220	155	Filing a brief in support of an appeal		121	270	221	135	Request for oral hearing		138	1,510	138	1510	Petition to institute a public use proceeding		140	110	240	55	Petition to revive - unavoidable		141	1,240	241	620	Petition to revive - unintentional		142	1,240	242	620	Utility issue fee (or reissue)		143	440	243	220	Design issue fee		144	600	244	300	Plant issue fee		122	130	122	130	Petitions to the Commissioner		123	50	123	50	Petitions related to provisional applications		126	240	126	240	Submission of Information Disclosure Stmt		581	40	581	40	Recording each patent assignment per property (times number of properties)		146	710	246	355	Filing a submission after final rejection (37 CFR § 1.129(a))		149	710	249	355	For each additional invention to be examined (37 CFR § 1.129(b))		179	710	126	355	Request for Continued Examination (RCE)		169	900	169	900	Request for expedited examination of a design application		Other fee (specify) _____						Other fee (specify) _____						* Reduced by Basic Filing Fee Paid						SUBTOTAL (3)				(\$)	
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SUBMITTED BY		Complete (if applicable)	
Name (Print/Type)	Clive D. Menezes	Registration No. (Attorney/Agent)	45,493
Signature		Telephone	(503) 684-6200
		Date	10/26/00

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

TITLE OF THE INVENTION

METHOD AND APPARATUS FOR MANAGEMENT OF CONFIGURATION
IN A NETWORK

INVENTORS

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention is related to network management. In particular, the present invention is related to a method and apparatus for management of configuration in a network.

Description of the Related Art

Network management stations perform network management functions including, but not limited to, fault detection, configuration of network elements, performance management, and security management. Typically, a network management station (NMS) invokes management software to communicate with agent software associated with network elements such as switches, routers, gateways, bridges, etc.

In the Internet, the protocol commonly used to communicate between a NMS and network elements is the Simple Network Management Protocol (SNMP). The set of specifications that define SNMP and associated databases may be found in Request For

Comments (RFC) 1155, 1213, and 1157. SNMP defines both the syntax and semantics of the messages that a NMS and agents exchange.

In addition to the SNMP, separate standards for Management Information Bases (MIB) define the objects that SNMP maintain, the operations allowed, and the meaning of the specified operations. For example, the MIB for the Internet Protocol (IP) specifies that the SNMP agent must keep a count of all octets that arrive over each network interface of a router and that the network managing station can only read the count. MIB variables may specify network status parameters and track various aspects of the status of a network. By keeping MIBs independent of the SNMP, additions to MIBs can be defined without affecting the installed base of SNMP based network management stations, and the protocol can be used to communicate with network elements that have different versions of the same MIB.

In order to configure and manage network elements, the NMS uses a fetch-store paradigm. The SNMP get-request and set-request commands are the basic fetch and store operations respectively. The SNMP trap command enables a network element to communicate asynchronously with a NMS. The trap command is initiated by an SNMP agent associated with the network element, and provides the NMS with notification of some significant event as to the status of the network element. Specific traps may be user defined, and the SNMP agent may transmit an SNMP trap command when one or more user defined object values change. In SNMP trap-directed polling, information regarding a change in the network element is included in the trap packet sent to the NMS.

The use of traps to communicate information to the NMS is unreliable as traps can be lost due to the connectionless oriented nature of the SNMP. For management of

configuration, lost traps are problematic because tracking network configuration requires that all changes in a network are reported to the NMS. Usually, network management stations regularly poll network elements in the network for the status and configuration of their managed objects. Based on the information regarding the managed objects obtained

5 from the agent associated with the network element, the NMS may take some action.

However, the polling mechanism used for configuring and monitoring networks is inefficient, especially if the NMS manages a large number of network elements. Periodic polling utilizes network capacity as polling is initiated by network management stations even when there may be no change in the objects that are being monitored. What is

10 needed, therefore, is a more efficient method to configure and monitor network elements.

BRIEF SUMMARY OF THE DRAWINGS

Figure 1 illustrates an example of a network in which an embodiment of the present invention is utilized.

Figure 2 is a flow diagram of an embodiment of the present invention.

5 Figure 3 illustrates an apparatus comprising an embodiment of the invention.

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DETAILED DESCRIPTION OF THE INVENTION

Described is a method for management of configuration in a network. In particular, the invention describes a method for managing the configuration of network elements such as routers, gateways, bridges, etc. by one or more network management stations in an Internetwork. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known architectures, steps, and techniques have not been shown to avoid unnecessarily obscuring the present invention. For example, specific details are not provided as to whether the method is implemented in a router, server or gateway, as a software routine, hardware circuit, firmware, or a combination thereof.

Parts of the description will be presented using terminology commonly employed by those skilled in the art to convey the substance of their work to others skilled in the art. Also, parts of the description will be presented in terms of operations performed through the execution of programming instructions. As well understood by those skilled in the art, these operations often take the form of electrical, magnetic, or optical signals capable of being stored, transferred, combined, and otherwise manipulated through, for instance, electrical components.

Various operations will be described as multiple discrete steps performed in turn in a manner that is helpful in understanding the present invention. However, the order of description should not be construed as to imply that these operations are necessarily performed in the order they are presented, or even order dependent. Lastly, repeated

usage of the phrase “in one embodiment” does not necessarily refer to the same embodiment, although it may.

Figure 1 illustrates a network 107 comprising a network management station (NMS) 104 connected to LAN 105 and managing network elements comprising router 101, gateway 102, server 103, and switch 109. In one embodiment, the NMS comprises a plurality of network management stations managing network configurations. Connecting the network elements are LANs 105, 106, 108 and 110. Each managed network element comprises agent software to communicate with the NMS. While the description that follows addresses the method as it applies to an internetwork architecture, it is appreciated by those of ordinary skill in the art that the method is generally applicable to any network architecture including, but not limited to, Local Area Networks (LANs), Metropolitan Area Networks (MANs), and Wide Area Networks (WANs).

As Figure 1 illustrates, the network 107 comprises a NMS 104 which could be a dedicated computer with network management software that configures and monitors network elements such as router 101, gateway 102, and server 103. Each network element has agent software installed that enables it to communicate with a NMS and hence with a network administrator, and provides the network administrator with configuration and status information of the network element. In one embodiment, the communication protocol between NMS software and agents is SNMP. One skilled in the art will appreciate that other network management protocols may alternatively be used by the present invention.

One embodiment of the present invention uses MIB objects to monitor configuration parameters on network elements. In particular, the invention uses a trap-

based method to monitor configuration parameters and changes thereto. Because the trap-based method is asynchronous, accessing the network element occurs only after a network element first sends the NMS a notification via a trap.

With reference to Figure 2, in one embodiment of the invention, at 210, the NMS first selects the configuration objects, whether represented by scalars (MIB leaf objects) or tables (MIB trees), it is interested in monitoring. This determination could be made either manually by a network administrator, or in accordance with a programmed algorithm. At 220, a request to monitor the selected MIB configuration objects is transmitted by the NMS to the agent software on a network element. Associated with each object in a MIB is an identifier called an object identifier (OID) that serves to uniquely identify the object. In one embodiment, the NMS writes to a MIB rules table associated with the network element identifying the OIDs it is interested in monitoring. In addition, the NMS transmits a rule to the network element specifying the conditions under which the network element is to send a trap to the NMS. Thus, each entry in the MIB rules table on a network element includes a rule that is used by the agent associated with the network element to generate a trap should there be an addition, deletion, modification, or any change in the configuration of the network element. In other words, if there is a change in the selected scalar, or in the value of any variable in a selected table, the agent associated with the network elements generates a trap.

In one embodiment, if the granularity of the selected MIB object is not supported by the agent, the agent sends a trap to the NMS with a less specific OID in the branch of the MIB tree. Thus, neither the agent nor the NMS have to keep track of each defined object on every network element. The trap is basically an indicator to the NMS notifying

it that some change has occurred in a configuration object on the network element that the NMS is interested in monitoring. If more than one NMS is monitoring the configuration of the network element, in addition to transmitting the selected MIB objects and a rule specifying the condition for sending a trap, each NMS transmits information regarding its own identity in the form of a trap destination index. The agent associated with the network element uses the trap destination index to identify a particular NMS to which a trap is transmitted. As an example, Table 1 below illustrates the process by which network management software tracks the configuration of virtual local area networks (VLANs) on a LAN switch.

300	Index = 5	essentially the next available index in the rules table.
305	RowStatus = ACTIVE	
310	Desired OID = extremeVlanIfTable	A table indexed by Interface number that stores a list of VLANs.
315	Operation = ANY	
320	TrapDestinationIndex = 2	This is the index of the net mgmt software host in the trap-receivers table.
325	SupportedOID=extremeVlanIfTable	The Agent software sets the value of SupportedOID, as either the value that was asked for, or to a less specific OID supported by the agent software.

Note: This rule means that if any operation is performed which causes a Vlan configuration, represented by extremeVlanIfTable to be added, deleted or modified, then a smarttrap instance is recorded, and the SNMP manager is notified.

Table 1

In Table 1 at 300, an entry is made in a MIB rules table located on the LAN switch, here called the extremeSmartTrapsRulesTable. At 305, the tracking for the defined OID is set to Active state. This means that the agent software on the switch starts

tracking the defined object identifier (OID). At 310, the NMS specifies that the desired
OID it is interested in monitoring is the extremeVlanIf Table. The OID is defined as
follows:

enterprises.extremenetworks.extremeagent.extremevlan.extremevlanigroup.extremevlaniftable.

5 At 315, the NMS specifies that for any change in the OID the agent on the LAN switch is
to notify the NMS by sending a trap. Thus, for example, if a VLAN is added, modified
or deleted, the agent is to notify the NMS by sending a trap. At 320, the agent software is
to send the trap to TrapDestinationIndex = 2. This is the index of a NMS in the trap-
receivers table. In this example multiple network management stations are monitoring
10 the configuration of the network. Hence, the trap is to be sent to the second NMS. At
325, the agent sets the value of the SupportedOID as the OID value specified by the
NMS. In one embodiment, if the selected OID is not supported by the agent, the agent
sets the SupportedOID parameter to a less specific OID that it does support, i.e., one that
is defined by the previous node in a branch of the MIB tree. In the example above, if the
15 NMS selects the extremevlaniftable OID for the agent to monitor, but the agent software
only supports the extremevlanigroup OID, then a trap is sent whenever the agent software
detects a change in the more specific than the supported OID, i.e., when there is a change
in any OID that is contained in the extremevlanigroup.

Returning to figure 2, at 230, once the agent has received an indication of the
20 selected MIB objects the NMS is interested in monitoring, the agent monitors the objects
for any changes in accordance with the specified rules. If no change is detected at 240,
the agent continues to track the OIDs. However, if a change is detected at 250, the
change is logged to a MIB instance table on the network element.

Table 2 below illustrates a MIB instance table on a network element.

400	Index = TrapDestinationIndex	obtained from the RulesTable. This identifies the manager for whom data was obtained.
405	RuleNumber = 5	which rule is this log corresponding to.
410	ChangedOID = extremeVlanIfTable.67	if the operation was performed on the vlan represented by the 67th index.
415	Operation = DELETE	if operation was delete.
420	ChangeTime = 9567423	the SysUpTime when this action happened.

Table 2

The entries in the MIB instance table include at 400, an entry identifying each network management station that requested the monitoring of the particular configuration object, at 405 an entry identifying the index of the rule in the MIB rules table in accordance with which the entry was created, at 410 an entry identifying the OID value that has changed, at 415 an entry identifying the operation performed that caused the generation of the trap, and at 420 an entry identifying the time when the entry was created.

Returning to figure 2 at 260, after logging the changes in the MIB instance table, the agent associated with the network element sends a trap to the NMS that initiated the writing of the selected MIB objects in the MIB rules table. The NMS, on receipt of the trap, at 270, may contact the agent that sent the trap and read the MIB instance table. At this time, the NMS may, in one embodiment of the invention, clear the MIB instance table. By having the NMS read the MIB instance table after receipt of the trap, rather than have the information sent to the NMS as part of the trap packet, as is done in SNMP-based trap polling, the embodiment of the present invention ensures that configuration

information is not lost due to dropped packets. Moreover, by having the NMS read the MIB instance table after receipt of a trap, rather than periodically polling the network elements, increased network bandwidth is made available for other applications. In another embodiment of the invention, if the NMS has not received a trap within some predetermined time interval, it is possible for the NMS to read the MIB instance table on its own initiative to examine the configuration of network elements. In one embodiment, polling of all the data tables is not necessary as merely reading the MIB instance table is sufficient. This is done infrequently as compared with the frequency of periodically polling the agents. Hence, despite this poll a substantial savings in bandwidth and processor utilization is achieved.

Figure 3, illustrates an apparatus that contains an embodiment of the invention on which the agent software is installed. The apparatus comprises I/O devices 300 that include a network transceiver, to receive a request to monitor at least one configuration object and to receive a request to read a log containing entries with regard to additions, deletions, modifications, or any changes to selected configuration objects. Communicatively coupled to the transceiver are one or more microprocessors 320 and memory 310. The agent software executed by the microprocessor monitors changes to the selected configuration objects, logs any changes to a file stored in the memory, and transmits a trap to a NMS. The memory stores a MIB rules table that contains the selected configuration objects along with the parameters or rules needed to generate a trap. The transceiver transmits, via network connection 330, a trap that is an indication to the NMS that a change in value of the selected configuration object has occurred.

In another embodiment, Figure 3 illustrates an apparatus that comprises a transceiver to receive a trap, that is, an indication from a network element of a change in a selected configuration object. Communicatively coupled to the transceiver are one or more microprocessors 320 and memory 310. The management software executed by the microprocessor analyzes the trap or indication received from the network element and manages the configuration of the network element accordingly. The transceiver transmits a request to monitor at least one configuration object on a network element, and to read the log containing the configuration changes on the network element.

Thus, a method has been disclosed for management of configuration in a network environment. Embodiments of the invention may be represented as a software product stored on a machine-readable medium (also referred to as a computer-readable medium or a processor-readable medium). The machine-readable medium may be any type of magnetic, optical, or electrical storage medium including a diskette, CD-ROM, memory device (volatile or non-volatile), or similar storage mechanism. The machine-readable medium may contain various sets of instructions, code sequences, configuration information, or other data. For example, the procedures described herein for polling network elements by network management stations can be stored on the machine-readable medium. Those of ordinary skill in the art will appreciate that other instructions and operations necessary to implement the described invention may also be stored on the machine-readable medium.

CLAIMS

What is claimed is:

- 1 A method comprising:
 - 2 receiving a request at a network element to monitor at least one object on the network
 - 3 element;
 - 4 logging information about the at least one object by the network element in response to a
 - 5 change in value of the object;
 - 6 transmitting an indication from the network element of the change in value of the at least
 - 7 one object; and
 - 8 receiving a request at the network element to read the information about the at least one
 - 9 object logged on the network element in response to the transmitted indication.
- 1 2. The method of claim 1, wherein receiving a request at a network element to
 - 2 monitor at least one object on the network element comprises establishing a rule in a
 - 3 management information base rules table on the network element to monitor a
 - 4 configuration object on the network element.
- 1 3. The method of claim 2, wherein monitoring a configuration object comprises
 - 2 logging a change in value of the configuration object as specified by the request.

1 4. The method of claim 2, wherein monitoring a configuration object comprises
 2 specifying the configuration object's object identifier in the management information
 3 base tree.

1 5. The method of claim 4, wherein specifying the configuration object's object
 2 identifier comprises using a less specific object identifier in the management information
 3 base tree, if monitoring the configuration object is not supported in the management
 4 information base tree.

1 6. The method of claim 1, wherein logging information by the network element in
 2 response to a change in value of the object comprises logging information about the
 3 change in the network element's configuration in a management information base
 4 instance table.

1 7. The method of claim 1, wherein receiving a request at a network element to
 2 monitor at least one object on the network element comprises receiving a request from
 3 one or more network management stations to monitor at least one object on the network
 4 element.

1 8. The method of claim 1, wherein transmitting an indication from the network
 2 element of the change in value of the object comprises transmitting a SNMP trap to a
 3 network management station whenever a change in value of the object is detected by the
 4 network element.

10 receiving a request at the network element to read the information about the at least one
11 object logged on the network element in response to the transmitted indication.

1 17. The machine-readable medium of claim 16, wherein said instructions for receiving a
2 request at the network element to monitor at least one object on the network element
3 includes further instructions to direct said machine to establish a rule in a management
4 information base rules table on the network element to monitor a configuration object of
5 the network element.

1 18. The machine-readable medium of claim 17, wherein said instructions for
2 monitoring a configuration object includes further instructions to direct said machine to
3 log a change in value of the configuration object as specified by the request.

1 19. The machine-readable medium of claim 17, wherein said instructions for
2 monitoring a configuration object on the network element includes further instructions to
3 direct said machine to specify the configuration object's object identifier in the
4 management information base tree.

1 20. The machine-readable medium of claim 19, wherein said instructions for
2 specifying the configuration object's object identifier includes further instructions to
3 direct said machine to specify a previous object identifier in the management information
4 base tree if the specified configuration object's object identifier is not defined in the
5 management information base.

1 21. The machine-readable medium of claim 16, wherein said instructions for
 2 transmitting an indication from the network element of the change in value of the object
 3 includes further instructions to direct said machine to transmit a SNMP trap to a network
 4 management station whenever a change in value of the object is detected by the network
 5 element.

1 22. The machine-readable medium of claim 16, wherein said instructions for
 2 receiving a request at the network element to read the information logged on the network
 3 element in response to the transmitted indication includes further instructions for a
 4 network management station reading the logged data from a management information
 5 base instance table on the network element.

1 23. An article of manufacture comprising:
 2 a machine-readable medium that provides instructions, that when executed
 3 by a machine, cause said machine to perform operations comprising:
 4 transmitting a request to a network element to monitor at least one object on the network
 5 element;
 6 receiving an indication from the network element in response to a change in the value of
 7 the object being monitored; and
 8 reading information logged on the network element in response to the indication
 9 received.

1 24. The machine-readable medium of claim 23, wherein said instructions for
2 transmitting a request to the network element to monitor at least one object on the
3 network element includes further instructions to write a rule to a management
4 information base rules table on the network element to monitor a configuration object of
5 the network element.

1 25. The machine-readable medium of claim 24, wherein said instructions for writing a
2 rule to a management information base rules table on the network element to monitor a
3 configuration object includes further instructions to write a rule to monitor at least one of
4 an addition, deletion, modification or a change in value of the configuration object by the
5 network element.

1 26. The machine-readable medium of claim 24, wherein writing a rule to a
2 management information base rules table on the network element to monitor a
3 configuration object includes further instructions to specify the configuration object's
4 object identifier in the management information base tree.

1 27. The machine-readable medium of claim 23, wherein receiving an indication from
2 the network element in response to a change in the value of the object being monitored
3 includes further instructions to read the information logged in a management information
4 base instance table on the network element.

1 28. An apparatus comprising:

5 a microprocessor communicatively coupled to the transceiver, and a memory to execute a
6 program to analyze information received from the network element and to manage the
7 configuration of the network element based on the information analyzed; and
8 the transceiver to receive an indication from the network element in response to a change
9 in the value of the configuration object.

1 32. The apparatus of claim 31 wherein the indication received by the receiver is a
2 SNMP trap.

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[illegible]

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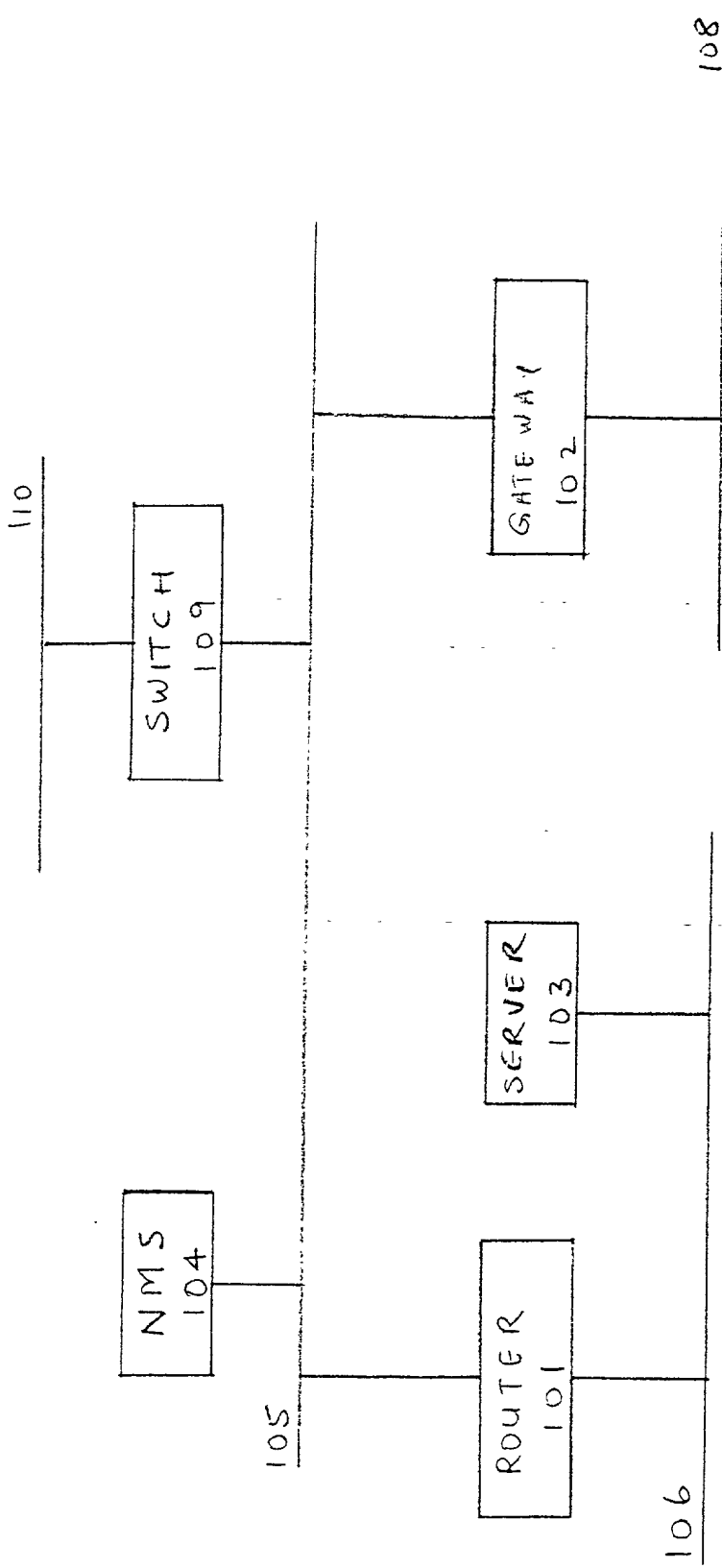


FIGURE 1

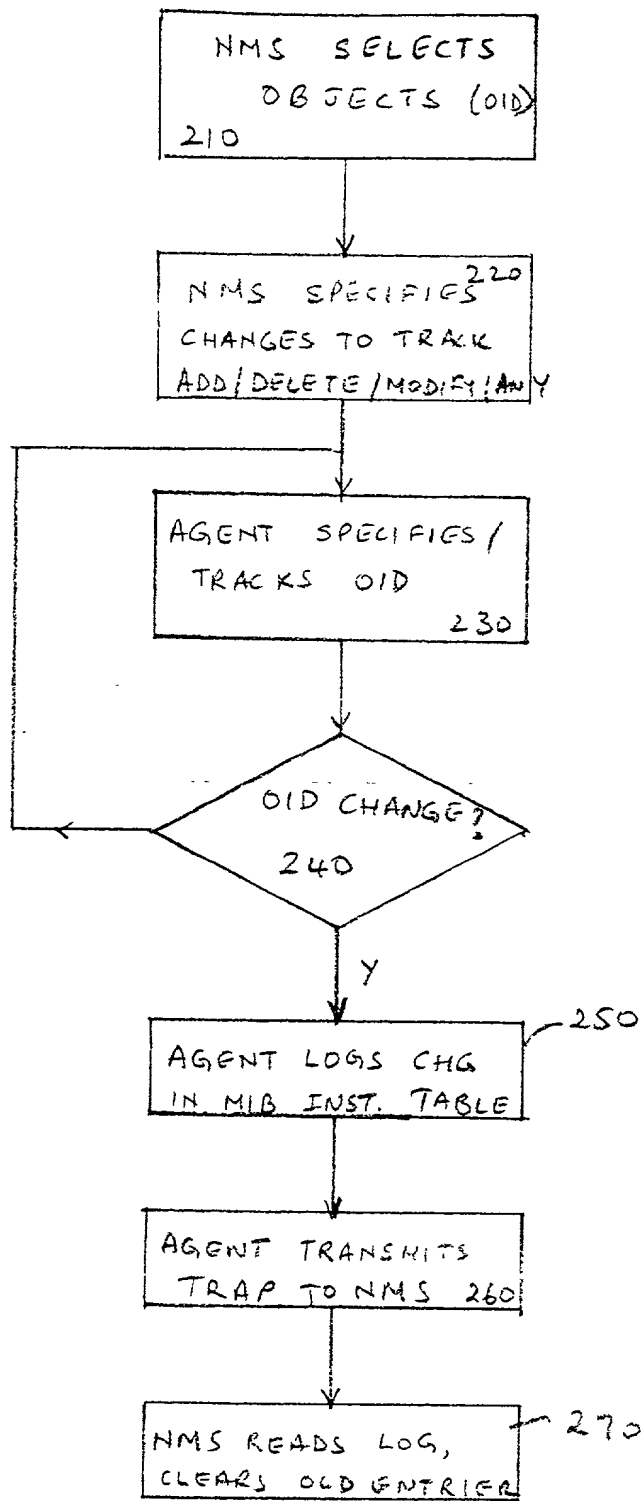


FIGURE 2

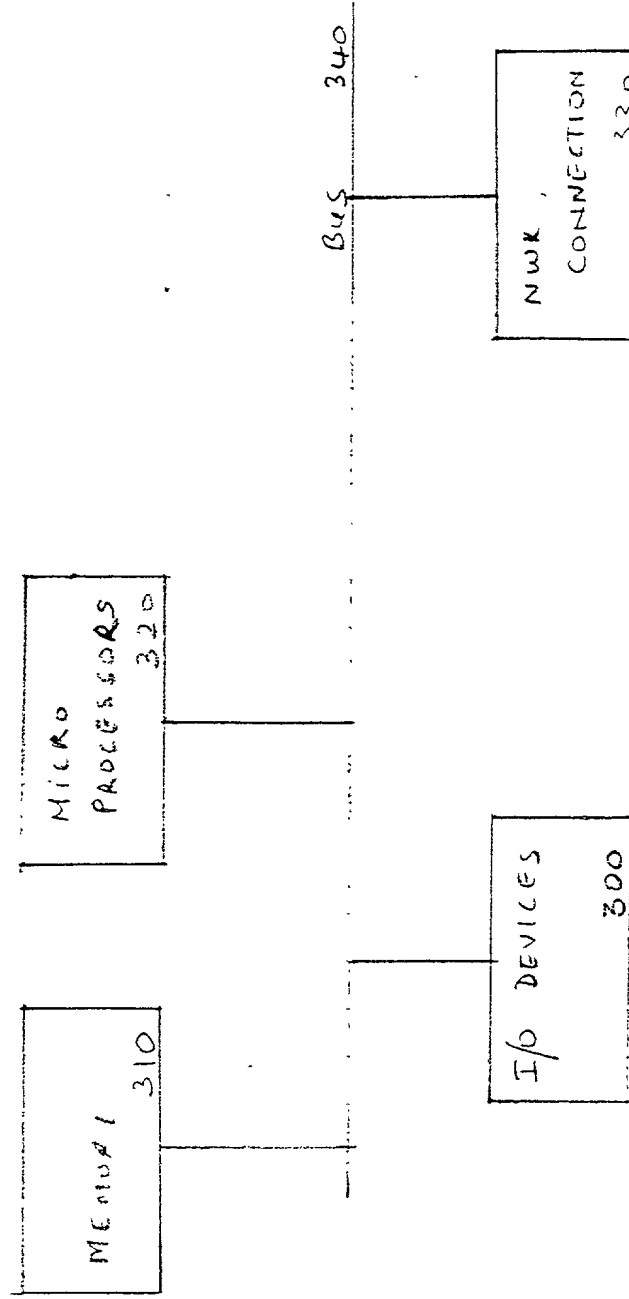


FIGURE 3

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or any original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND APPARATUS FOR MANAGEMENT OF CONFIGURATION IN A NETWORK

the specification of which ☒ is attached hereto.

☐

was filed on _____ as _____

United States Application Number _____

or PCT International Application Number _____

and was amended on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			<input type="checkbox"/> No <input type="checkbox"/> Yes
			<input type="checkbox"/> No <input type="checkbox"/> Yes
			<input type="checkbox"/> No <input type="checkbox"/> Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Send correspondence to:

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(Name of Attorney or Agent)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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